REVIEWS.

ART. XVII.—*Hypodermic Injections in the Treatment of Disease.*

1. *Hypodermic Injections in the Treatment of Neuralgia, Rheumatism, Gout, and other Diseases.* By ANTOINE RUPPANER, M. D., Fellow of the Massachusetts Medical Society. pp. 160. Boston, 1865.
2. *On the Speedy Relief of Pain and other Nervous Affections, by means of the Hypodermic Method.* By CHARLES HUNTER, Surgeon to the Royal Pimlico Dispensary, etc. etc. pp. 64. London: John Churchill & Sons, 1865.
3. *Die Hypodermatischen Injectionen nach clinischen Erfahrungen,* von Dr. E. LORENT in Bremen. pp. 48. Leipzig, 1865.
   Clinical Experience with Hypodermic Injections, by Dr. E. LORENT, of Bremen.
4. *Die Hypodermatische Injection der Arzneimittel. Nach physiologischen Versuchen und klinischen Erfahrungen bearbeitet,* von Dr. ALBERT EULENBERG, Privat-Docent und Assistant Arzt der chirurgischen Universitäts-Klinik in Greifswald. Eine von der Hufelandischen medicinisch-chirurgischen Gesellschaft gekrönte Preisschrift. Mit einer lithographirten Tafel. pp. 218. Berlin, 1865.
   The Hypodermic Injection of Medicines, treated according to Physiological Experiments and Clinical Experience, by Dr. ALBERT EULENBERG, Private Teacher and Assistant Physician of the Surgical Clinic of the University of Greifswald. A Prize Essay of the Hufeland Medico-Chirurgical Society.

THERE can be no question that the administration of medicines by injection into the subcutaneous cellular tissue is a most important addition to our therapeutic resources. Avoiding the pain which attends the endermic method, and securing a more direct entrance to the economy than the digestive organs afford, it insures certainty of effect to our remedies, and so obviates in an important particular one of the uncertainties of our art. As a means of relieving pain it rivals even the inhalation chloroform in certainty and rapidity of action, surpasses it in permanence of effect, while it is free from any objections which might be made in regard to danger.

The brief space of time within which it has established itself in the profession is a proof of its value, as it is, too, a complete refutation of the oft-repeated slander, generally made by the adherents of some form of quackery which has not succeeded in establishing any merit, that we are slow to adopt improvements in our profession, and indeed, set ourselves obstinately against progress. First used by Dr. Wood, of Edinburgh, and made known by him in 1855, it was largely tested, and the results published in 1859, by Dr. Hunter, of London, while Behier, Courty, and Follin, of France, and Oppolzer and Scanzoni, of Germany, are chief among those who in that and the succeeding year spread intelligence of its merits. In this country Dr. Ruppaner was the first writer upon the subject (May, 1860), until now we believe the knowledge of it is very general and the practice rapidly extending among us, while its value is nowhere denied, certainly by no one who has given it a fair trial.

The works whose titles stand at the head of this article are among the few which have yet been published upon the subject. That of Dr. Ruppaner was, we believe, the first to appear in our language, certainly the only one which has appeared in this country, and therefore of additional interest. It is a condensed but well-written treatise, presenting a sketch of the history of the introduction of hypodermic medication, describing the necessary instrument and the operation, indicating the class of cases to which it is adapted, and the remedies best administered in this way; containing everything in fact necessary to instruct and guide a practical physician in the matter. It is especially marked by, and valuable for, its detail of cases treated by the author himself, of which he gives sixty at greater or less length.

Dr. Hunter's work is mostly made up of an assemblage of papers written by him for medical societies or journals. It therefore lacks that methodical arrangement and finish which belong to a treatise. While it contains much of value, and being the production of an early labourer in this field of research, cannot fail to be of great interest, it is marred, we think, by a tone of injured *amour propre*, arising from a contention with Dr. Wood, of Edinburgh, as to priority in use of hypodermic injections for general diseases and the necessity of localizing the injection in cases where they are used for relief of pain. Much space of his little work is thus occupied which we cannot but think would have been better filled with details and examples from the large amount of experience he has undoubtedly had with this method of treatment.

The work of Dr. Lorent is a brief and modest contribution to the subject, and, as its title indicates, essentially clinical in character. Evidently a practical man, and a man of practice, he has investigated the subject to discover what aid he could derive from it in his daily encounters with disease. His experience seems to have been large, numerous cases are given in detail, and his relation of them bears the impress of truthfulness as does his whole work, and exhibits as well moderation of expression and unbiassed judgment.

Dr. Eulenberg's prize essay is a work of wider scope and higher aim. It may be said to cover the whole ground in every particular up to the time it was published, an appendix being added while it was in press. With true German comprehensiveness and minuteness of detail, it aims at exhausting the subject. Had Tubal Cain, "the first worker in brass and iron," ever made an instrument for hypodermic injection, we should undoubtedly find a description of it here. Its bibliography includes every work published upon the subject, and every magazine article, not excepting those of our own country, as we find mentioned the *American Journal of the Medical Sciences*, the *Transactions of the American Medical Association*, and Prof. Goldsmith's name, in connection with the injection of bromine. It gives in detail all that is known of the action of every medicine thus administered, of the rarer alkaloids as nicotin, ergotin, conia, and woorara, and hydrocyanic acid; every disease thus treated, or proposed to be treated, comes under notice, even to stuttering, prolapsus of the rectum, and extra-uterine pregnancy! Further, in his chapter on "the forensic relations of subcutaneous injections," the author writes in view of a future, which may we never see! when there will be hypodermic

Palmers, and Pritchards, and Martha Grinders! But it must not be supposed that the work is a mere compilation of other men's observations and opinions; the author has worked faithfully in person upon his subject, and the "physiological experiments and clinical experience" of the title-page are found throughout the work; he has studied the subject both theoretically and practically, and his work contains his own observations faithfully detailed, and his conclusions clearly stated, as well as the results obtained by other labourers in the field.

We proceed first to inquire, what are the inconveniences or dangers attending this mode of medication, and how are they to be avoided? It is limited, certainly, in the range of its applicability; limited by the form and dose of the medicine, and perhaps adapted to the treatment of but a small number of diseases; facts which do not conflict with the high praise bestowed upon it. The pain attending the puncture with the syringe is insignificant, yet dread of even so small an amount of "cold steel" may prevent its use in some very nervous persons. No local after-effect of any consequence has been anywhere recorded; and the one objection of note arises from the much smaller quantity of a medicine necessary to produce an effect when used in this manner than when introduced into the stomach. So far as the preparations of opium are concerned, this objection is easily met; care and accuracy in regulating the dose obviate all danger from this source, in other words, it needs but to be known to be avoided. We have heard several rumors of severe symptoms and even sudden death having followed subcutaneous injection of morphia, the presumption being that a vein had been punctured and the medicinal solution poured directly into the current of the circulation. Introduced in this way, far more violent effects result than when it is simply deposited in the cellular tissue. The only well-authenticated case of alarming symptoms produced in this way is that of Prof. Nussbaum, of Munich, which has been generally copied into the medical journals.[1] To this we may say, first, it was the only instance out of a great number of injections; "he had injected morphia under his own skin more than two thousand times!" So Graefe says he has injected the temporal region "hundreds of times," Dr. Wood made over one hundred injections in one patient, and Eulenberg has made sometimes forty or fifty, and in one case four hundred, without meeting with a single instance of unpleasant result. Second, the dose was very large for the mode of administration, two grains of acetate of morphia, an amount which could only be reached by long-continued use of the medicine. It may be well to mention here the mode of avoiding danger proposed by Prof. Nussbaum *apropos* of this case; it is, to inject *very slowly;* the violent effects being almost immediate in their appearance the injection can be stopped in time to prevent danger. We suggest also the withdrawal of the point of the syringe for a short distance before pushing down the piston; the elasticity of the tissues, it seems to us, would close any puncture of a vein which might have been made, and thus prevent ingress of the injected fluid.

We copy from Dr. Lorent's work the only other instance of severe symptoms produced by morphia, and in reference to this case call attention again to the *dose*, which was far above the maximum quantity generally administered hypodermically:—

"We have seen deep narcotism follow the injection of morphia but once.

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[1] Am. Journ. Med. Sciences, January, 1866, p. 240, from Med. Times and Gaz.

The patient was a delicately-formed male, forty-three years of age, suffering from delirium tremens; one grain of morphia was administered. The pupils were so contracted as to appear entirely closed, perfect anæsthesia to pricking with a needle existed in the skin, the pulse was very slow, respiration sank even to six in the minute, so that, fearing a fatal termination, artificial respiration was maintained. The threatening symptoms, however, soon subsided, and from the favourable termination of the delirium tremens, which soon followed, the large dose seemed to have exerted a good influence." (p. 11.)

It would seem, however, that all the alkaloids are not so reliable as to the relation of effect to dose when used subcutaneously as morphia. Atropia is indicated particularly by Dr. Lorent as a medicine requiring great care in its use with the first injections, and especially with females. He relates a striking case where only $\frac{1}{190}$ of a grain produced very serious symptoms, and two others in which unpleasant effects followed the injection of a quantity below the ordinary dose. Dr. Eulenberg gives a similar case which will be detailed farther on.

Is the effect of medicines thus introduced into the system identical with that following ingestion? With the exception of Dr. Hunter, the authors whose works are before us answer this question in the affirmative, or believe in a far less degree of modification of their action; it is in their effect upon general diseases, or upon diseases of the nervous centres, rather than as used merely for the relief of pain, that he believes them to differ most widely in their action from the usual standard. Thus he says (p. 15):—

"In cerebral affections medicines called anodynes frequently act so far more effectually, and so differently from the stomachic doses of the same, as almost to warrant us in considering them as different medicines."

He maintains that morphia used subcutaneously has a sedative influence upon the circulation not produced by it when absorbed from the stomach:—

"The action of the heart is diminished in proportion to the dose injected. Thus, in mania, I have reduced it from 120 to 80 in four minutes." * * * * "This first and lowering effect produced upon the circulation is a point of practical importance in the treatment of inflammation." (p. 33.)

Atropia, according to him, does not have a similar effect upon the circulation, but he claims to have discovered new or different powers for this alkaloid than those usually accorded to it:—

"Let me first dispel the idea that atropine is a cerebral narcotic. I do not consider it as such. Atropine is rather a stimulant at the onset than a sedative. Its first effects upon the heart, lungs, and general circulation are not those that at all predispose to sleep, as I have shown those of morphia do. But it is occasionally a narcotic, and the sleep is, I believe, brought about indirectly. The *sensations* seem first to be benumbed, pain to be relieved, and sleep follows. The sleep of atropine begins with the eyes open, but the vision asleep, with a few vague movements of the hands; the respiration deep and regular, but not stertorous, and the pulse will continue twenty beats or so in the minute higher than usual." (p. 35.)

The action of medicines is, however, undoubtedly modified in some degree by subcutaneous injection. Thus Dr. Hunter speaks very strongly, far more so than we are yet prepared to do, as to constipation not following opiates thus introduced:—

"Given by the cellular tissue neither morphia nor opium ever constipates. I have used the morphia injection for weeks together, in cases of chronic disease, the bowels acting daily—but never acting without medicine in the same patients, if the morphia was given by the mouth." (p. 18.)

The unpleasant symptoms produced by opiates are not however escaped by administering them subcutaneously. It is, perhaps, expecting too much to anticipate that we shall ever find a means of avoiding the nausea and sickness which follow the introduction into the system of opium and its preparations in some subjects, and which deny their blessings and benefits to so many. Certain it is, as we speedily found by experience, these unpleasant symptoms do follow the administration of narcotics in this way, and all these authors state the fact, although the testimony inclines to the view that the evil effects are lessened in degree, perhaps sometimes entirely escaped. Dr. Ruppaner claims to avoid them by using only a minimum dose—finding a "point of tolerance" of the narcotic beyond which he does not pass. (p. 154.) Dr. Hunter places the frequency of occurrence of these unpleasant symptoms lower than any of the other writers; still he admits that they do occur, and sometimes even prevent the use of these medicines hypodermically as well as otherwise, although in a glowing comparison he makes in one place (p. 15) between the condition of the patient after the hypodermic administration of morphia and after its ingestion, he entirely ignores them.

Medicines injected subcutaneosly have a double action—a local and a general effect; they influence the nerves of the part injected, and by the circulation the nervous centres. Which of these is the most important, and does the former depend entirely upon the latter? It will have been already gathered from our remarks that there is a difference of opinion upon this question. All the authorities answer it affirmatively except Dr. Hunter; he alone maintains, and with more warmth we think than the occasion demands, that localization of the injection for a local disease, as neuralgia, is not necessary, and these are his reasons:—

Equal benefit follows the distinct injection—therefore localization is not necessary.

There are certain objections to localization: 1, the infliction of unnecessary pain; 2, the almost certain risk of irritating, thickening, or inducing matter in the part by repletion; 3, many cases of neuralgia would be excluded from treatment were localization necessary.

Commencing with the objections, we feel bound to answer to the first that injecting in the *same identical spot* is not a necessary part of the doctrine of localization, and therefore *more* pain is not occasioned; the answer to the second is already given in our statement, from authorities, of the insignificant local effects produced by the injections even when many times repeated; to the third, and to the proposition laid down that equal benefit follows the injection whether made near to or at a distance from the affected point, we say that by increasing the range of applicability of hypodermic medication benefit is conferred upon the profession and upon humanity, and the author of it deserves credit for the discovery. To Dr. Hunter belongs undoubtedly a share of the credit, possibly the major portion of it, yet we hesitate to decide a question of this kind about which a journal controversy has been carried on for some months between him and Dr. Wood, of Edinburgh; certainly it would not be fair to do so without examining both sides. Dr. Hunter undoubtedly deserves credit for his efforts in extending the practice of hypodermic medication to general diseases, and to diseases of the nervous centres, as mania and delirium tremens, and to this end his doctrine of the non-necessity of choosing the point to inject must have tended.

But we must examine other witnesses in regard to this doctrine that the locality of the injection has no influence in the cure even of such a disease as neuralgia. As we have said, there is great unanimity in favour of the opposite view, Ruppaner considers the question (pp. 36–44), gives his own experience, and quotes Béhier; their pathological experience is strongly confirmatory of their views. Dr. Lorent writes to the same effect. So does Dr. Eulenberg, whom we rather quote because his work is not as accessible as the one in our own language, and because his testimony is given without reference to any controversy or disputed claims whatever, all of this having occurred since he wrote; he simply investigates the question as a scientific problem. He states that in a case of double rheumatic sciatica observed by him, complete relief of pain for a space of from two to three days followed each injection *upon the side upon which the injection was made*, while upon the other side the pain immediately returned upon the subsidence of the effect of the narcotic upon the nervous centres.

But not content with this proof this author instituted a series of experiments by means of a comparison of the sense of touch, as measured by Weber's instrument, applied to corresponding points of the surface upon the two sides of the body. These experiments are recorded and tables of the readings given in his work (pp. 42–51). They show unmistakably that the general view is the correct one. We have only space for his conclusions:—

> "After the subcutaneous administration of various narcotics (morphia, atropia, caffein), the sensibility of the region injected is considerably diminished, while the corresponding symmetrical region of the other side of the body shows no change, or a relatively much lesser degree of diminution."
>
> "If an injection be made at a point where a sensitive (or mixed) nerve runs superficially under the skin (for instance, about the head of the fibula, peroneal nerve), sensibility is diminished not only at the place of injection, but also over the whole surface to which the nerve is distributed; nevertheless, in the greatest degree at the point of injection."

A word as to the remedies used subcutaneously and their doses. Of course only those can be administered which are small in bulk; the next most important quality is ready solubility. The alkaloids, therefore, stand at the head of the list of hypodermic medicines, and, being the great remedy for pain, morphia at the head of the alkaloids. There is quite a wide range of variety, however, shown as to the form; thus Dr. Ruppaner prefers Squibb's liquor opii compositus, of which one hundred drops are equal to one grain of sulphate of morphia; Lebert uses extract of opium and water, of each equal parts; some use one salt of morphia and some another, the acetate being the favourite. For the benefit of those who may desire to commence subcutaneous injections, we have prepared the following posological table:—

	RUPPANER.	EULENBERG.	LORENT.
Salts of morphia . . .	gr. $\frac{1}{8}$—$\frac{3}{4}$	$\frac{1}{8}$—$\frac{1}{2}$	$\frac{1}{6}$—$\frac{1}{2}$
Sulphate of atropia . .	gr. $\frac{1}{60}$—$\frac{1}{30}$	$\frac{1}{60}$—$\frac{1}{24}$	$\frac{1}{40}$—$\frac{1}{16}$
Muriate of strychnia . .	gr. $\frac{1}{24}$—$\frac{1}{6}$	$\frac{1}{18}$—$\frac{1}{8}$	$\frac{1}{25}$—$\frac{1}{10}$
Aconitia		gr. $\frac{1}{30}$—$\frac{1}{15}$	$\frac{1}{30}$
Tinct. cannabis indica . .	gtt. x—xx		
Ext. " " . .		gr. iij—vj	
Liq. opii comp. . . .	gtt. v—lx		
Sulphate of quinia . .		gr. i—ij	gr. j$\frac{3}{4}$

The mode of regulating the dose generally followed is by means of a graduated syringe, or one with a graded piston-rod which screws down, each revolution of the screw expelling a known quantity of liquid. Such instruments are difficult to obtain here and expensive. We have had no trouble in regard to accuracy of dose by measuring the capacity of the barrel of the ordinary syringe with a minim glass; then with a solution of acetate of morphia (gr. j ad aqua fʒj) dissolved with the aid of a drop or two of acetic acid, the dose can be very closely regulated.

Two of Dr. Hunter's rules as to doses are very good:—

> "Concerning first injections, never use more than half the ordinary stomachic dose for males, nor more than a third for females.
>
> "Should a second injection be necessary, let it not be used too soon, nor in a full dose when the patient is partly under the influence of the narcotic."

The range of application of hypodermic medication we have said is not wide; it covers, however, very important ground from the fact that pain, the great torturer of the race, from whose torments our patients imperatively demand relief, can be certainly and speedily controlled by it. The worst of all pain is neuralgic, therefore the neuralgias are best adapted to this mode of treatment; then come some of the spasmodic diseases and of the paralyses; next to these follow diseases of the eye, delirium tremens, rheumatism and gout, and malarious fevers. But without detailing the particular diseases in which it may be used, the general indications may be stated as follows:—

Those cases in which it is necessary to obtain the general effect of a remedy with the utmost possible rapidity and in its greatest power; as, for instance, in cases of poisoning, or of pernicious fever.

When a local and direct effect upon sensitive or motor nerves is desired in addition to the general effect of the remedy; as in neuralgia and paralysis.

When the internal administration of the medicine is interfered with by functional disturbances of the digestive organs; as in cases of obstinate and violent vomiting; or where the ingestion is rendered difficult or even impossible, as in cases of foreign bodies in the œsophagus, trismus, hydrophobia, and the obstinate refusal of medicines by the insane.

Under this last head came a case in the treatment of which hypodermic injections proved to us an invaluable resource; in a delicate and nervous female suffering from gastritis, vomiting was so persistent, so rebellious to all other measures, and so aggravated by even the thought of medicine, that we are convinced no other means would have sufficed to moderate and finally control the disease.

Although neuralgia alone by far surpasses all other diseases in regard to hypodermic medication, we can scarcely enter upon its consideration, certainly cannot go into particulars as to the various forms of the disease. To one point, however, we call attention; the injection of narcotics in this disease must not be looked upon as merely a palliative measure; cures will be effected by this means alone in a fair proportion of cases; thus Eulenberg reports eight cases of radical cure out of twenty-eight treated. Dr. Ruppaner also reports many cases cured without resorting to other means. To this gentleman's book we must refer the practitioner for full particulars as to the treatment of this disease, while we translate from the work of the former the following general observations:—

> "The injection of morphia is the best palliative means for the relief of idiopathic as well as symptomatic neuralgia, and one that almost never disappoints.
>
> "The injections may effect a radical cure in idiopathic neuralgia of recent date and peripheral origin, whether it affects the whole region supplied by a nerve, or only that of a single branch.
>
> "The use of injections in the treatment of neuralgia, however important they

> may be, do not justify us in neglecting to consider the cause of the disease as an indication to treatment, nor the use of those other remedies which experience has shown to be useful." (pp. 88-90.)

The twitching of the muscles after severe fractures, and the jerking of stumps of amputated limbs, so often causing patients intolerable anguish, are forms of nervous disturbance which seem to yield in a peculiarly happy manner to morphia introduced subcutaneously.

We prefer to occupy what space remains at our disposal with some of the rarer instances of hypodermic medication.

In cases of poisoning by atropia and hyoscyamus, morphia has been subcutaneously injected, and the results have been so favourable and striking that its antidotal powers in such cases can no longer be called in question. Bell, of Edinburgh, was the first proposer of this method (1857), but many authors have since reported cases—Béhier and Courty, and more recently Graefe. The cases in Dr. Lorent's work, already referred to, in which violent symptoms followed the injection of atropia, were treated by throwing morphia under the skin, and relief followed almost immediately. Eulenberg quotes at length the report of two cases of poisoning by hyoscyamus, from Rezek; the patients were children, three and a half and one and a half years old respectively; the quantity of poison taken unknown, but symptoms violent; loss of consciousness, convulsions, stridulous respiration, widely-dilated pupils; in one case continuing after emetics and other measures had been put in force; then morphia was injected, in one case one-sixth grain, in the other one-eighth grain, when recovery rapidly followed. In the first case—"after five minutes the convulsions became less frequent; in ten minutes the patient was asleep and breathing as peacefully as if nothing had happened."

The following case from Eulenberg is a striking instance of the rapidity of action and benefit of this mode of treatment:—

> "In a lady suffering from facial neuralgia I injected $\frac{1}{48}$ grain of atropia; alarming symptoms of poisoning soon arose. The patient threw herself about the bed entirely unconscious, and from time to time broke out in furious delirium; the limbs and also the head were shaken with convulsive jerkings. The pupils were moderately dilated, the pulse small, somewhat increased in frequency (88). I injected immediately $\frac{1}{3}$ grain of morphia into the temporal region, in close proximity to the former place of injection. The result was striking; the twitchings ceased within scarcely more than three minutes, and in ten minutes the patient fell into a heavy peaceful sleep, with deep, stertorous [!] respiration. The pulse had fallen to sixty-eight in the minute. Upon awaking, eight hours after the injection, both pupils were of normal dimensions, and there were no symptoms of poisoning present." (p. 199.)

There is one curious fact to be noticed in this connection; however speedily and surely morphia may counteract the poisonous effects of atropia, it will not contract the dilated pupils produced by this mydriatic. We quote again from Eulenberg, page 119:—

> "In some cases where atropia had been instilled into the eye for diagnostic, not therapeutic, purposes, I injected morphia (gr. $\frac{1}{8}$–$\frac{1}{6}$) in the neighbourhood of the affected eye, in order to shorten the unpleasant mydriasis. The trials were made upon seven persons, and at from two to ten hours after the application of the atropia. However surely morphia, subcutaneously injected, may act as an antidote to atropia, and however general its production of myosis in a normal state of the pupil, its effect upon the atropia-widened pupils was in the highest degree unsatisfactory. In only two of the seven patients did a slight diminution of the dilatation take place, at six and nine hours after the injection—ten to six hours after the atropia was applied; and in these two cases the amount of

atropia which reached the eye may have been small. In the remaining patients there was no perceptible effect after more than twelve hours, so that the closing of the pupil which followed in the course of two or three days could not be attributed to the morphia."

In the latter part of 1863, Prof. Nussbaum, of Munich, made the announcement that an injection of morphia under the skin, made just before or during the production of insensibility by chloroform would extend and perpetuate the condition of anæsthesia for a period of several hours. So important an announcement deserves attention, and we are surprised that the statement has not ere this been investigated, and either verified or refuted; yet we have looked through the medical journals in vain for any notice of further observations or of experiments instituted bearing on the question. The works under notice probably contain all that has yet been made known in regard to it. Dr. Eulenberg copies briefly from Nussbaum, the four cases upon which his statement is based, and then reports one case which fell under his own observation and which seems to support the theory; next he gives a case in which it failed, and in the appendix speaks of two others, operations for removal of lower jaw, in which it was unsuccessfully tried. We notice that in Nussbaum's cases the amount of the narcotic injected was large—in two cases one grain—a larger dose than it is prudent to administer in this manner to an untried patient, and a dose against which Dr. E. feels compelled to warn his readers "as seldom demanded and causing very easily unpleasant symptoms, very often distressing vomiting." In the successful case which he saw one-fourth of a grain of muriate of morphia was used, and we say it *seemed* to succeed because it was a case of castration during and after which there was much hemorrhage from repeated giving way of the ligatures, with great depression from the loss of blood, and under these circumstances it cannot be looked upon as a fair case.

To assist in solving the problem, Dr. Eulenberg instituted a series of experiments upon animals, and chose rabbits for his subjects. Unfortunately he anæsthetized them with ether; unfortunately, because whether his statement be true or not, that "the condition of the central organs during ether-narcosis is less favourable to the action of morphia than during the narcotism produced by chloroform," the terms of the problem being varied, the results could not bear upon the solution. He only found, however, a prolongation of the anæsthetic condition amounting to minutes, instead of hours, but admits, at the same time, that experiments upon animals cannot decide this question for man. He quotes in connection the experiments of Salva with dogs, the results of which were more confirmatory of Nussbaum's doctrine.

We extract from Dr. Lorent's work (p. 23) his single observation of the conjoined influence of the two remedies:—

> "The combination of quietude by injection of morphia and narcosis from chloroform we have only once unconsciously observed: Chloroform was administered to a primipara for version, after draining away of the waters, on account of cross-birth; one-fourth of a grain of morphia had been previously several times injected. The patient fell into an uncommonly deep sleep, so that the difficult turning and the completion of the birth were entirely unknown to her. She awoke only after a considerable time, and had not the slightest consciousness of the entire delivery."

It is to be deeply regretted that we must await further facts before we can decide so interesting and important a question. To be able to prolong the effects of chloroform without increasing the amount of it administered, and without adding to the risk of unpleasant results, would be a great boon to patient and surgeon in very many operations; the value of it is evident at a glance, and we know few questions which are more worthy of close investigation and an early solution than this.

For the use of subcutaneous injections of narcotics in order, by the local anæsthesia produced, to facilitate laryngoscopy, we are indebted to Dr. Eulenberg, and as this new specialty is attracting considerable attention, we believe we shall do good service by giving pretty fully what has been ascertained in regard to it. The author alludes to the failure of all the means heretofore proposed for the purpose, and quotes Tobold (*Lehrbuch der Laryngoskopie*, 1863) to the effect that operations upon the larynx will always be among the most difficult and delicate of surgery, so long as we do not possess a local anæsthetic with which we can benumb so sensitive a part of the body.

> "This impelled me to try the effect of subcutaneous injections of morphia, especially as it did not appear impracticable to approach pretty nearly the internal branch of the superior laryngeal nerve in the neighbourhood of its point of passage through the hyo-thyroid membrane, and which nerve is principally distributed to the mucous membrane of the upper part of the larynx and vocal cords."

Then follows a case of polypus on one of the vocal cords; the patient could not endure the application of caustic or polypus forceps; cough and spasm frustrated all attempts at removal. After injection of one-eighth of a grain of morphia on each side, the difference was striking, and this proved to be the case upon a second trial.

The favourable result having been observed by Dr. Beneke, "an experienced auto-laryngoscopist," he made a trial upon himself—a trial which resulted in entire disappointment.

Dr. Tobold's attention having been called to the matter, he also gave it a trial in the case of an old lady afflicted with laryngeal polypus. After injection of one-fourth of a grain of morphia, quoting Dr. T.'s own words, "he could touch the lower surface of the epiglottis with instruments longer than it had hitherto ever been possible to do."

The testimony is scanty and unfortunately conflicting; it stands, therefore, another undecided question, but one far from insignificant or unimportant.

In the treatment of malarious fevers, hypodermic medication bids fair to yield as brilliant and substantial results as for any other disease; the certainty and rapidity with which it overcomes pain are rivalled by its control over intermittents, if the testimony of those who have used it is to be relied on. There certainly need be no great delay in deciding its merits, and fixing every detail of treatment. As in many sections of our country malarious fevers are the prevailing diseases during a considerable portion of the year, there is abundant opportunity for trial, as there will be an overflowing measure of benefit resulting should the observations already published be substantiated. Dr. Chasseaud, of Smyrna, was the first, we believe, to institute this plan of treatment.[1] His reports are extraordinarily favourable, so much so as to excite that suspicion which will always be called forth by too warm an advocacy of a measure. He treated cases in which the gastric symptoms prevented the usual mode of medication. Of

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[1] Amer. Journ. Med. Sci., Oct. 1863, p. 533.

150 cases he saw but one relapse after three months, using generally but a single injection, and prescribing occasionally a little iron afterwards. Goudas reported, in *l'Union Médicale*, for 1862 (quoted by Eulenberg), fifteen cases with the like result. Moore reports extensive experience of this plan and with most encouraging results.[1] Turning now to the works under notice for information upon this interesting and important point, we find none at all in those of Ruppaner and Hunter, the rarity of this class of diseases in the section of country where they live being undoubtedly the reason. Eulenberg gives first his experience in solving the question whether an injection of quinia during the cold stage would stop the febrile paroxysm; he reports two cases in which he was successful, the amount used being two grains. We have, in two instances, injected that amount of quinia about an hour before the chill, and put a stop to the disease. Dr. E. next reports three cases in which a single injection was made during the apyrexia of intermittents, and sufficed for a permanent cure. Dr. Lorent's experience has not been great with this remedy; he has injected gr. $1\frac{7}{8}$ at the beginning of the cold stage, and has seen the paroxysm shortened, and the disease cured by "several repetitions" of that amount. He has not been able to cut short the disease with so small a dose as two grains. He has found the same practical difficulty in the administration of this medicine which has interfered with its use in our hands—the want of a solution sufficiently concentrated without containing so much acid as to cause too much irritation to the tissues. Moore, who was in the Bombay service, used a solution of "thirty grains of quinia, ten or twelve drops of sulphuric acid, and half an ounce of water;" of this, previously strained, he injects from half a drachm to a drachm. The bulk is here too great, as Dr. Lorent remarks, and he proposes the use of the acetate of quinia, "of which thirty grains will dissolve, by the aid of heat, in two and a half drachms of water." We have had no opportunity of trying this plan; we found, however, that quinia with glycerine is too thick to discharge well through the syringe.

We think it would be difficult to exaggerate the importance of this improvement in our art to those portions of our country scourged by malaria, and we cannot refrain from again urging an investigation of its merits upon the profession, requiring as it does no complicated apparatus, no trained skill in delicate manipulation, but simply a spirit of enterprise, careful observation, and candid report of results. Whether it will entirely or generally supersede the internal administration of quinia or not, there can be no comparison between the two modes in those cases where gastric symptoms are prominent, rendering it impossible for the patient to take or retain the bitter drug in the stomach; in those dangerous cases of pernicious or congestive fever, known through the west as "sinking chills," where the patient's life depends upon bringing the system under the influence of the remedy within a brief space of time. In addition to these points, the economic view of the question is one not unworthy of consideration in the case of so expensive a medicine as quinia; if two or even four grains will suffice instead of a scruple, the money difference to hospitals, infirmaries, dispensaries, and in army practice will be of no small account.[2]

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[1] Amer. Journ. Med. Sci., Jan. 1865, p. 241.

[2] Since the above was in type there has fallen under our notice a report of a letter upon the hypodermic injection of quinia, from Dr. James McCraith, senior surgeon to the Smyrna and Aidin Railroad, read before the Royal Medical and Chirurgical Society in December last. He has found it especially useful in the

In one particular the work of Dr. Ruppaner differs from the others, and we must not omit to notice it. It contains a record of his experience with injections used in a manner different from ordinary, the fluid being thrown deep among the tissues along the course of a nerve, instead of just beneath the skin, the solution being irritant in character with the object of exciting local inflammation and suppuration. The plan is not original with this author, but was proposed by Dr. Luton, of Rheims (to whom due credit is given by Dr. R.), to the Paris Academy of Medicine (Sept. 1863), under the name of "parenchymatous substitution." We will let Dr. R. state the argument:—

> "Cases of neuralgia, especially chronic cases of sciatica, are often benefited by counter-irritation along the course of the affected nerve. It is, therefore, plausible to suppose, that if we inject a strong solution of any irritant near the painful point—for example, in the course of the sciatic nerve—that deep-seated counter-irritation can be established, which, though limited in extent, would be sufficient, if not to remove the disease, yet at least materially to improve it." (pp. 26, 27.)

He claims that a saturated solution of chloride of sodium, or a strong solution of nitrate of silver, deeply injected, does not cause much pain, is not followed by *diffuse*, but by *circumscribed* inflammation and suppuration. The cases he reports are five in number, and support his theory so far as so limited a number can do; they are interesting certainly for the reason he claims, as being "the first cases of neuralgia treated in the United States by the injection of *irritants.*" For further particulars as to this mode of using injections, we must refer our readers to the work itself.

Hypodermic medication is yet in its infancy; already, as we have shown, it presents a number of most interesting and important practical questions for solution; that in regard to these, and in other respects, it has a brilliant future before it, we do not doubt, and shall await with interest further knowledge of the subject. J. C. R.

ART. XVIII.—*Stimulants and Narcotics, their Mutual Relations; with Special Researches on the Action of Alcohol, Ether, and Chloroform on the Vital Organism.* By FRANCIS E. ANSTIE, M. D., M. R. P. C., Assistant Physician to Westminster Hospital, Lecturer on Materia Medica and Therapeutics to the School, and formerly Lecturer on Toxicology. 8vo. pp. 489. London: Macmillan & Co., 1864.

The same. 8vo. pp. 414. Philadelphia: Lindsay and Blakiston, 1865.

UNDER the guidance of researches which have for their aim the comprehension of the most recondite processes of the animal organism, a new school of physiology and pathology has made its way to the favour of the medical profession. It has able representative men, and its teachings

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pernicious form of malarious fever, and details the case of a patient "who had been in a profound coma for a long time, and was incapable of swallowing anything, and was rapidly relieved by the injection of three grains and a half of quinia in each arm." Dr. McCraith "does not think the hypodermic method will supersede the usual treatment by the mouth, but that it will prove extremely useful where a great scarcity of the remedy exists, or where the symptoms will not allow of its exhibition by the usual method.